Cell biology meiosis and mitosis assignment

Cell Biology (CP8121) Experiment 2: Observing Mitosis and Meiosis on cell specimens (Formal report) Name: Wong Chung An Class: DMLS/FT/1B/02 Admin number: P1138687 Summary This experiment aims to observe mitosis and meiosis on cell specimens. It involves the modelling of the stages of meiosis and also the staining procedures to identify mitosis in onion root tip. There are two parts to the procedure of the experiment whereby the first is staining and observing mitosis in onion root tips and the second being observing and comparing mitosis between whitefish blastula and onion root tip.

The results are that the five stages of mitosis have been observed and sketched, together with a comparison of telophase in plant and animal cells. The difference between the two types of cell division mitosis and meiosis has also been recorded. The conclusion is that all the objectives of the experiment have been met and it is recommended that the mitotic spindle be stained for a more complete picture of the various stages of mitosis. 1) Introduction It is important that the experiment is carried out so as to differentiate between the two types of nuclear division, mitosis and meiosis.

Mitosis is a process mainly for the growth and replacement of somatic cells and it involves the replication of chromosomes which results in having two daughter cells each same as the parent nucleus. On the contrary, meiosis is for the production of gametes which is essential for an organism’s reproduction and it comprises of two successive nuclear divisions which results in the production of four haploid cells. Mitosis: A process which replicates chromosomes exactly so that each of the daughter cells contains identical information.

The process of mitosis involves five stages. The five stages are: Interphase, Prophase, Metaphase, Anaphase and Telophase respectively. Meiosis: A process whereby two successive nuclear divisions will produce four haploid cells. There are two rounds of cell division in meiosis, mainly meiosis I and meiosis II. Meiosis I is identical to that of mitosis whereas meiosis II is a round of reductional division. The process of meiosis has allowed for an escalation of genetic variations because of the crossing over of the genes.

This process is crucial as it produces half the number of chromosomes as per the human sex cells. For humans, every gamete contains 23 chromosomes and fertilisation of an egg by a sperm will restitute the diploid number of 46 chromosomes 2) Objectives * Learn a staining procedure to identify mitosis using onion root tip. * Compare and contrast mitosis in plants and animals. * Compare and contrast stages of mitosis and meiosis * Model stages of meiosis. 3) Procedures (a) Preparation and observation of onion root tip slide) An onion root tip was obtained and the first 1-3mm of its root tip was cut off using a scalpel. The root tip was then placed at the centre of a clean slide using a forceps. 2) Then, the root tip was covered with 2-3 drops of 1N HCL solution and then placed over the hot plate for 3-5 seconds using a slide holder. 3) Without touching the root tip, the excess acid was then blotted off using a paper towel. 4) After which, the root tip was then covered once again, this time in 3-4 drops of 0. 5% Toluidine Blue solution. 5) The excess stain was blotted off and a cover slip was added.) To spread out the stained root tip for visualisation, the slide was placed in the middle of a folded paper towel and applied pressure upon by placing the thumb directly above the cover slip and having it gently pressed on against a lab bench. 7) The slide

was examined on low power on the microscope and embryonic cells which are square-like were looked for. 8) Once the mitotic figures were found, the microscope was switched to a higher power. 9) The phases that were seen were sketched on the datasheet. (b) Observation of prepared slides: Mitosis in Onion root tip ; Whitefish blastula) The prepared slides provided were reviewed by using a low power (10x) to locate the cells and high power (40x) to change the focus. 2) This time, instead of sketching the different phases of mitosis in onion root tip, the differences in mitosis between the plant and animal cells were recorded. 4) Results and Discussion *For the results, refer to the datasheet archived under appendix at the end of the report. 5. 1 Explanation and reasons for results The results of the datasheet have shown that all the five main phases of mitosis can be observed.

This can because of several reasons such as the choice of use of onion root tips, flattening of the onion root tips, addition of hydrochloric acid and 0. 5% Toluidine Blue solution. Onion root tips are easy to grow in large numbers and the cells at its tips are actively dividing, thus many of its cells will be in different stages of mitosis. The reason for using the last 1-3mm of the root tip is because it is where the region of cell division (meristem) is located. This is the region whereby cells are dividing but not significantly increasing in size.

The flattening of the onion root tips allows the chromosomes of each individual cell to be observed. The hydrochloric acid added, plays a part in fragmenting the root tissues by weakening and removing the bonds between cells so that each cell will not be attached to the other cell, obstructing the observation. Toluidine Blue solution acts as a colorant, giving a blue colour to

the chromosomes and so that it is more easily spotted and examined. 5. 2 Evaluation of the results achieved Interphase: The interphase is the phase in which the cell is involved in metabolic activity and fulfilling its role as part of a tissue in the body.

During this phase, the DNA duplicates as it is preparing for mitosis and the chromosomes are cannot be easily distinguished. However, the nucleolus, a dark spot may be visible instead. Prophase: During the prophase, the chromatin within the nucleus will begin to condense and become visible in the microscope as chromosomes. Then the nuclear membrane will dissolve, signalling the start of Prometaphase. After which, proteins would then attach to the centromeres, creating kinetochores in which the microtubules will attached to. The chromosomes would then start moving.

Metaphase: The chromosomes would then be aligned by the spindle fibres at the equator of the spindle. This alignment helps to ensure that in the anaphase, when the chromosomes are separated, each of the new nucleuses will receive a copy of each of the chromosomes. Anaphase: In the anaphase, the two sister chromatids of each chromosome at the centromeres would start to separate. This movement is due to the shortening of the kinetochore microtubules. Telophase: The two sets of daughter chromosomes would arrive at the two poles and the mitotic spindle would disappear.

A nuclear envelope would start to form around each set of daughter chromosomes at both ends of the poles. Cytokinesis may have also begun during this phase depending on each individual cell. 5. 3 Descriptions of problems encountered The problem that we have encountered during this

experiment was during the preparation of the first slide of onion root tip. The amount of toluidine blue solution may not be enough as only a few of the cell nucleus have been stained. This makes it difficult for us trace the various stages of mitosis.

This problem is resolved however by making a new set of the onion root tip slide. 5) Conclusions and Recommendations In conclusion, the experiment was a success and all of the objectives of the experiments were met. All five stages of mitosis have been observed and a comparison of mitosis between plant and animal cells has been made. Although we did not get to observe the stages of meiosis, we have modelled the stages of meiosis and acquired knowledge of it. In my opinion, I would recommend that the mitotic spindles of the onion root tip cells be stained as well.

This would allow a more in depth observation of mitosis and instead of solely looking at the movement of the chromosomes and the nucleus, we could observe the reason behind the movement of the chromosomes. 6) Appendix

http://www. marietta. edu/~biol/introlab/Onion%20root%20mitosis. pdf Clark, D. C. and P. M. Mathis. (2000). Modeling mitosis and meiosis: a problem-solving activity. The American Biology Teacher Mickle, J. E. 1990. A model for teaching mitosis and meiosis. The American Biology Teacher Carmen Chan Yuen Man (2011). Cell Biology lecture notes (CP8121). Singapore Polytechnic.